Item #70: Live Trees, Snags and Coarse Woody Debris Retention

Evaluation Question: Is post-treatment retention of live trees, snags and coarse woody debris consistent with natural variability and Forest Plan projections?

Resources to be measured:

- Snags/acre and coarse woody debris tons/acre over time

Data Sources:

- Forest Inventory and analysis (FIA) Summary Database

This monitoring item was established in 1999 with completion of Amendment 21 to the Forest Plan and was designed to look at retention of forest structure within treated areas.

A forest-wide summary of post-treatment data on stand structure components is not consistently available, as conditions are assessed during post-treatment exams on a unit by unit basis, and stored in District stand files. Every treated area has a silvicultural prescription prepared prior to treatment which specifies desired levels of live tree retention, snags, and coarse woody debris (CWD). These targets are set to be consistent with management objectives, understanding of natural variability, guidance in A-21, and existing conditions. During and after harvest, conditions are monitored to assess whether all aspects of the prescription are being met. These structural aspects of the prescription are assessed during sale administration site visits, along with regeneration and fuels treatment results. In many cases it is anticipated that the trees retained in a commercial thinning, or in seed tree or shelterwood harvest, will provide snags and downed woody debris into the future and may substitute for currently lacking structure. Results of this monitoring report help silviculturists refine future prescriptions.

Several other sources of data may help indicate the levels of snags and woody debris, and trends over time.

Recent research conducted on the Flathead National Forest (Wisdom and Bate, 2008) suggests that snag densities are considerably higher in unharvested areas than in harvested areas. This study looked at a stratified random sample of 49 stands with a larch or pine overstory, and analyzed 10 variables which might be related to snag density. Factors significantly influencing stand density included seral stage, timber harvest, and proximity to roads, distance to the nearest town, and whether the stand was uphill or downhill from the nearest road. Mean snag density for all species was found to be 19 times higher in unharvested stands compared to stands with a complete harvest (clearcut), and 3 times higher than stands that had undergone partial harvest. Clearly harvest has had a significant influence on snags. This study did not address the range of natural variability.

A Northern Region analysis of western Montana snag densities using the FIA summary database (2009 analysis) is currently being finalized. This analysis summarizes range of snag densities inside wilderness and outside, grouped by habitat type group and seral stage, as well as data on the distribution of snags across the landscape. Data was compiled for western Montana, as well as each forest individually, where number of plots was sufficient. While wilderness/roadless

areas do not totally represent “natural conditions” due to fire exclusion, they provide the best data on untreated forest conditions.

A portion of that data is included below. This snag summary is based on FIA data measured in 1993-94 which does not yet include the tremendous number of snags created by subsequent large fires. That data will be incorporated, as it becomes available.

For most of the habitat type groups, the mean number of snags in each size class is lower in the non-wilderness/roadless plot clusters. Confidence intervals are broad and overlapping, making it difficult to make firm conclusions about any impacts from management activity.

This would seem to be consistent with Wisdom and Bate’s results. Presumably differences in snag density on similar sites inside and outside wilderness/Roadless are a function of road access and firewood gathering, seral stage, fire history and fire management strategies, and active vegetation management.

When plots are re-measured in fire areas, there will be an increase in means both inside, and outside of wilderness.

Mean number of snags in wilderness increases over time (successional stage) for the dry and mid-elevation moist sites, while it declines in subalpine and lodgepole pine types. Outside of wilderness, snag number increase over time in all types. Categories of increasing snag numbers with time would seem to be indicative of non-stand replacing disturbance such as insects, disease or mixed severity fire causing additional snag recruitment.

One very interesting result reveals the clumpiness of snags on the landscape at any given time. Data for western Montana shows that 15 inch and larger snags occurred in wilderness on between 4% and 22% of the plot clusters (looking at habitat groups). Outside of wilderness, the range is 4% to 16% of plots found to contain any snags greater than 15 inches. That indicates that many areas of the forest, both inside and outside wilderness, had virtually no large snags, while other areas had an abundance of snags at a given point in time. The broad range of the confidence intervals is indicative of the uneven distribution of snags across both wilderness/roadless and managed landscapes.

Table 70-1. 1993-94 FIA Summary Database Statistics on Snag Density

Wilderness /Roadless	Species	Final Habitat Type Group	Snags per Acre 10"+			Snags per Acre 15"+			Snags per Acre 20"+		
			Mean	90% CI- Lower Bound	90% CI - Upper Bound	Mean	90% CI- Lower Bound	90% CI - Upper Bound	Mean	90% CI- Lower Bound	90% CI - Upper Bound
IN	Mixed	Dry	**4.9**	0.9	10.2	**2.9**	0.4	6.4	**0.7**	0.1	1.3
IN	Mixed	Low Mid Elev-Moist	**9.0**	2.5	16.2	**2.9**	0.0	5.8	**2.9**	0.0	5.8
IN	Mixed	Subalpine	**12.2**	9.4	15.4	**3.5**	2.7	4.4	**1.1**	0.8	1.4
IN	LP	All	**3.7**	1.1	7.0	**0.3**	0.0	0.7	**0.1**	0.0	0.2
OUT	Mixed	Dry	**9.3**	2.9	17.1	**2.6**	0.3	6.5	**1.0**	0.1	2.1
OUT	Mixed	Low Mid Elev-Moist	**10.2**	1.9	21.7	**6.6**	1.0	13.6	**2.9**	0.4	6.0
OUT	Mixed	Subalpine	**10.4**	7.6	13.5	**2.7**	1.9	3.5	**1.1**	0.7	1.7
OUT	LP	All	**6.5**	0.0	18.1	**0.0**	0.0	0.0	**0.0**	0.0	0.0
FLATHEAD FOREST AVERAGES	**Mixed**	**Dry**	**6.9**	3.1	11.2	**2.8**	0.8	5.2	**0.8**	0.3	1.4
	Mixed	**Low Mid Elev-Moist**	**9.9**	3.3	18.9	**5.8**	1.5	11.2	**2.9**	0.9	5.3
	Mixed	**Subalpine**	**11.6**	9.4	13.9	**3.2**	2.6	3.8	**1.1**	0.8	1.4
	LP	**All**	**4.4**	1.4	8.0	**0.2**	0.0	0.5	**0.1**	0.0	0.2

Table 70-2. Fuel Loading (FIA Summary Database Statistics)

Wilderness /Roadless	Species	Final Habitat Type Group	Total Fuel Load Tons/Acre			
			Mean	90% CI- Lower Bound	90% CI - Upper Bound	Number of FIA Plot Clusters
IN	Mixed	Dry	**27.3**	18.4	36.2	19
IN	Mixed	Low Mid Elev-Moist	**39.6**	30.7	48.5	2
IN	Mixed	Subalpine	**52.2**	46.9	57.5	150
IN	LP	All	**44.1**	34.9	53.3	43
OUT	Mixed	Dry	**32.2**	25.3	39.1	15
OUT	Mixed	Low Mid Elev-Moist	**52.1**	45.2	59	7
OUT	Mixed	Subalpine	**61.3**	54.4	67.7	89
OUT	LP	All	**46.7**	28.4	65.0	13
FLATHEAD FOREST AVERAGES	**Mixed**	**Dry**	**29.4**	18.6	40.2	34
	Mixed	**Low Mid Elev-Moist**	**49.3**	42.9	55.7	9
	Mixed	**Subalpine**	**55.6**	51.3	59.9	239
	LP	**All**	**44.7**	36.4	53	56

No significant difference between wilderness/roadless and areas outside is apparent in this coarse woody debris (CWD) data, as broad confidence intervals overlap. The majority of the forest lies within the subalpine habitat grouping, where measured woody debris totals ranged from less than 2 tons/acre to 271 tons/acre. Looking at the data for stands over time, the forest average CWD by age class hovers between 45 tons/acre and 60 tons/acre, without an obvious trend over time.

Evaluation

It seems clear that treated areas do have fewer snags than untreated areas, which may be a concern over time. Harvested areas since 1945 (60 years) consist of only 12% of the total forest acreage or about 36% of the area outside of wilderness/roadless. This may or may not be significant at the landscape scale, or to specific wildlife species habitat.

In the last decade, treatments have been designed to maintain much more structure and provide for protection of current snags to the degree safely possible. Fire salvage prescriptions are designed to assure that many snags are retained, to provide for a "pulse" of important bird habitat and soil nutrients. The effects of firewood cutting on overall snag retention are also considered in designing snag retention standards. Prescriptions for treatment over the last decade have also recognized the value of CWD and prescribed for retention levels based on habitat type. For nutrient recycling purposes, generally 5 – 20 tons/acre are prescribed. While this is less than the forest averages detailed above, in conjunction with the snags and standing trees, it should provides for CWD over the life of the stand.

This baseline data should provide the basis for looking at trends in these important habitat components. As described in item 68, fire is responsible for much larger scale change than management activity, and will be the greatest factor in determining future levels of snags and coarse woody debris.

Regional updates to the FIA Summary Database are scheduled to occur this year. This update will incorporate five years of new measurement data as well as new fire, harvest, and land exchanges. Regional reporting of snag and downed woody data is scheduled to be updated annually in the future, and will provide the basis for reporting this monitoring item.

Recommended Actions: Continue to monitor this item.

- Continue with project level monitoring during and after treatments to assure that desired end results are being met.
- During Forest Plan Revision, use FIA data for this monitoring or provide for systematic monitoring of specific stand attributes, and a means for aggregating monitoring results at the forest level, or drop this monitoring item.